

Organic Farming Practices for Soil and Water Conservation

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Introduction

Indian farmers have innate knowledge and proficiency in organic farming as it is their traditional way of agriculture. During the 1960s the demand for food production has increased and created much pressure on land and water resources. Out of a total reported geographical area of 329 Mha of India, about 146.8 Mha are degraded by various factors among that water and wind erosion together account for 70% of the total degraded land. At present 145 Mha is under cultivation and there is no scope to bring more area under cultivation. It has forced the farmers to adopt high yielding varieties, intensive cropping and unscientific crop and soil management techniques. However, the green revolution leads the country to be self-sufficient in food production but poses many problems to natural resources that threaten sustainable agriculture. Crop type and management practices also play a critical role in erosion. Soil degradation, particularly soil erosion is intensified due to modern agricultural practices. The modern age farmers became production oriented and never considered the requirement of soil and crop. The indiscriminate use of chemical inputs in the form of pesticides, fungicides and fertilizers for the high yielding varieties resulted in reduced soil organic matter, soil biodiversity, water holding capacity, increased soil compaction and ultimately land degradation. Apart from the onsite impacts, the excessive chemicals carried through soil and water during soil erosion causes eutrophication problems in water bodies. Nowadays, the chemical inputs are available in ready to use form, easy to apply, requires less labour and expertise. In contrast, laborious organic manures production, tedious transport and

handling process, low availability of organic manures made organic farming a challenge for the farmers.

Organic Agriculture

Organic farming is recognized as an alternative for intensive agriculture to face environmental challenges. As per the definition of FAO Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs.

Soil and water conservation through organic farming

Though the organic farming practices do not influence directly on soil conservation, the following organic farming practices indirectly help to reduce soil erosion and soil degradation

1. Organic inputs

Higher soil organic matter in surface soil increases the soil stabilization and reduces the soil erosion. The soil with rich floral and faunal biodiversity has high resilience power to environmental changes. The practice of applying more organic inputs will increase the soil organic matter that supports soil biodiversity. The erodibility of the soil is reduced by improved soil structure, soil aeration and aggregate stability due to soil organic matter addition. Organic matter acts like a sponge and helps to absorb and store water in soil profile.



2. Crop Rotation

Crop rotation with cereals and pulses is one of the essential components in organic farming to increase atmospheric nitrogen fixation and recycle nutrients from different depths of the soil profile. Studies suggest that crop rotation in organic farming has reduced one third of soil erosion. Crop rotation with crops having different root architectures also helps to reduce soil erosion besides improving soil fertility.

3. Inter cropping

Crop diversification plays major role in organic farming, as response of the crops will vary in any climatic or other external disturbances and reduce the risk of farmers. Hence, intercropping is widely adopted in organic farming. The highly diversified crops are more resource efficient as different species have different strategies for resource utilization. Intercropping is best method for crop canopy management for soil erosion control and obstructs overland flow in sloppy lands. Farmers can choose the crop with dense and fast canopy covering crop as intercrop to reduce the impact of rain drops and water erosion.

S.No	Main Crop (Erosion Permitting Crop)	Intercrop (Erosion resistant crops)
1.	Maize	Cowpea (1:2)

2.	Rice	Groundnut/ Soybean (3:1)
3.	Maize	Groundnut/ Soybean (1:1)
4.	Potato	<i>Lablab purpureus</i> L (1:1)
5.	Maize	Faba bean
6.	Wheat	Soybean

4. Cover crops and green manuring

The principle of organic farming is replenishing the soil nutrients through green manuring or growing cover crops. The green manure crops or the cover crops are grown in between two crops therefore; the soil surface is covered with vegetation and check the splash erosion. Growing these crops also helps to recover the nutrients applied to the previous crop that may otherwise lost through leaching. Further, the enhanced soil surface cover, roots and organic matter will increase infiltration by stabilizing soil aggregates. Cover crops like buck wheat, lupin, fodder oats and mustard are suitable for hilly regions.

5. No chemical inputs

The chemical inputs used for agriculture production greatly affects the soil microorganisms, which are indeed responsible for fertile soil. The excessive use of chemicals cause soil compaction that pose problems for crop root growth, aeration and drainage, accelerated runoff and erosion. Studies showed that weed control with herbicides increases soil erosion rates in row crops. However, pest and disease management through mechanical and biological practices does not cause any pollution to environment and water bodies and enhance the pest-predator balances in the system.

6. Crop residue recycling / Mulching

Composting plant residues along with animal waste is a good practice to reduce the crop residue burning. The heat produced during crop residue burning penetrates the soil and elevate the temperature kills the soil micro organisms, cause loss of soil organic carbon which is critical for a fertile soil. One ton stubble burning will cause loss of 5.5 kg nitrogen, 2.3 kg phosphorus, 25 kg potassium and more than 1 kg of sulfur besides organic carbon. The burning also causes air pollution in the surrounding areas. Mulching with plant residues also proved to be effective in soil erosion control as the surface cover with plant residue protect the soil than the crop canopy.

7. Soil fertility maintenance

Intensive farming results in multi nutrient deficiency, whereas organic farming ensures the supply of all the essential nutrients through organic manures. Obviously soils that can supply all the essential nutrients enhance crop growth, biomass production and resilient to soil erosion.



Conclusion

During the last 5 decades, incredible achievements have been made in Indian agriculture, but many challenges to be encountered in future to ensure the sustainability of natural resources like soil and water. Organic farming consider as the sustainable solution of intensive agricultural interventions. Soil health and quality maintenance is the well recognized benefit of organic farming all over the world. Nevertheless, soil erosion and degradation also influenced by various organic farming practices like organic matter addition, cover cropping, green manuring, crop rotation, intercropping, mulching and crop residue recycling. Though organic farming is not directly influence the soil erosion, it enhances the soil resilience against soil degradation.

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